SAVING OLD WINDOWS

REPUTTY

REGLAZE

REPAINT

REPAIR

By Thomas Baker

The eye-pleasing shadows and profiles of old sash, with the jewel-like reflections of its old glass, are a big reason traditional houses appeal to us. Next to the look of an old wood window, most modern, "low-maintenance" windows fall far short. Yet in our eagerness to lower heating bills and live in draft-free comfort, we often heedlessly consign old windows to the dump, even though storm windows and weather-stripping might fix the problems. By throwing out a window, we are removing a key element of a home, one that can tell us about the craftsman who assembled it, the owner's economic status and social aspirations and the materials and technologies of a bygone era. At 124 Federal Street, the current *This Old House* project in Salem, Massachusetts, the home inspector said the windows were "past their useful life." Master carpenter Norm Abram was convinced they should be saved. "The old sash on this house are amazing," he says. "Just look at the condition of the wood. After 230 years, it's still in great shape. I wonder if today's windows, made with fast-growth wood, will hold up as long, even though they're treated with preservatives." On the following pages, Norm and the crew demonstrate ways to save the old windows, from simple repairs and reglazing (which, done and maintained properly, should last for 20 years) to the full-scale rebuilding of a sill.

PHOTOGRAPHS BY DAVID BARRY

Window Anatomy

SASH

The framework that holds the glass. Consists of stiles (vertical members), rails (horizontal members) and muntins. Most sash in this country is either single- or double-hung (slides up and down in a jamb) or casement (side-hung on hinges). The word sash is used to denote both singular and plural.

MUNTINS

Narrow, rabbeted strips of wood that support the glass panes within a sash frame. Not to be confused with mullions, the vertical elements that separate side-by-side windows.

FRAME

The wooden structure that houses and supports the sash.

JAMB

The vertical part of the frame within which the sash slides or rests.

PANE

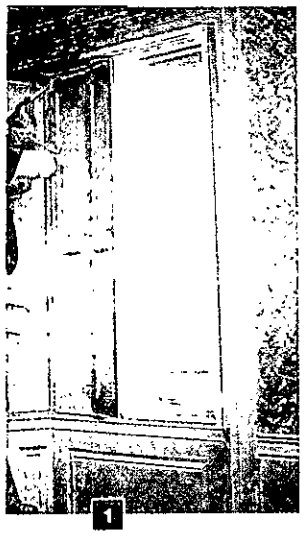
The glass or glazing in the sash. Also called a light.

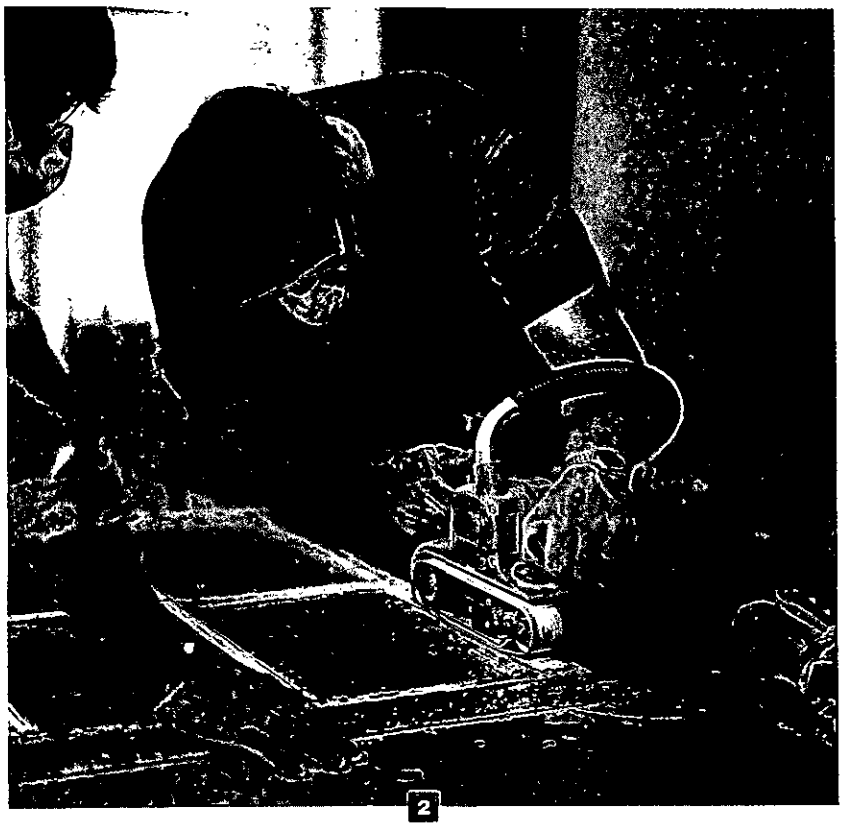
SILL

The lower exterior member of a window frame, beveled outward to shed water.

Window Talk...Translated

To a window expert, the old Federal-style windows on the Salem house are "plank-frame with single-hung, six-over-six, plain-rail sash." Translation: *Plank-frame*—the window frame is made of thick wood members, mortised and tenoned and pegged together, then nailed to the outside of the wood sheathing. (Windows nowadays are mounted between the studs.) *Single-hung*—only the bottom sash moves. *Six-over-six*—there are six panes of glass in both the top and bottom sash. *Plain-rail*—the sash slide directly against each other. In later windows, the sash slide in separate tracks.





How to Reglaze a Sash

Of the three components in a window sash—the wood, the glass and the glazing compound (or putty) that holds the glass in place—the compound is the weak link. In time it hardens and cracks, opening a pathway for water. When that happens, about every 20 years, it's time to reputty and reglaze.

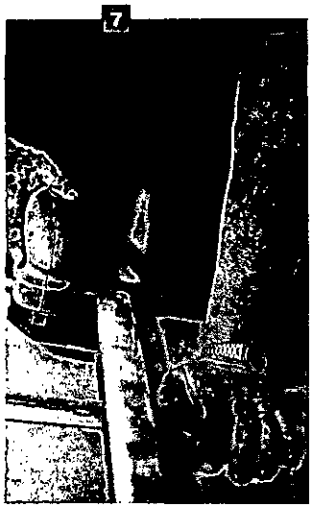
Norm reglazed and reputtied the windows of his grandmother's boarding-house when he was a youngster. He has strong memories of those summer days and the tangy smell of linseed putty on his hands. His most important discovery about reglazing: "There are no shortcuts. You have to take your time."

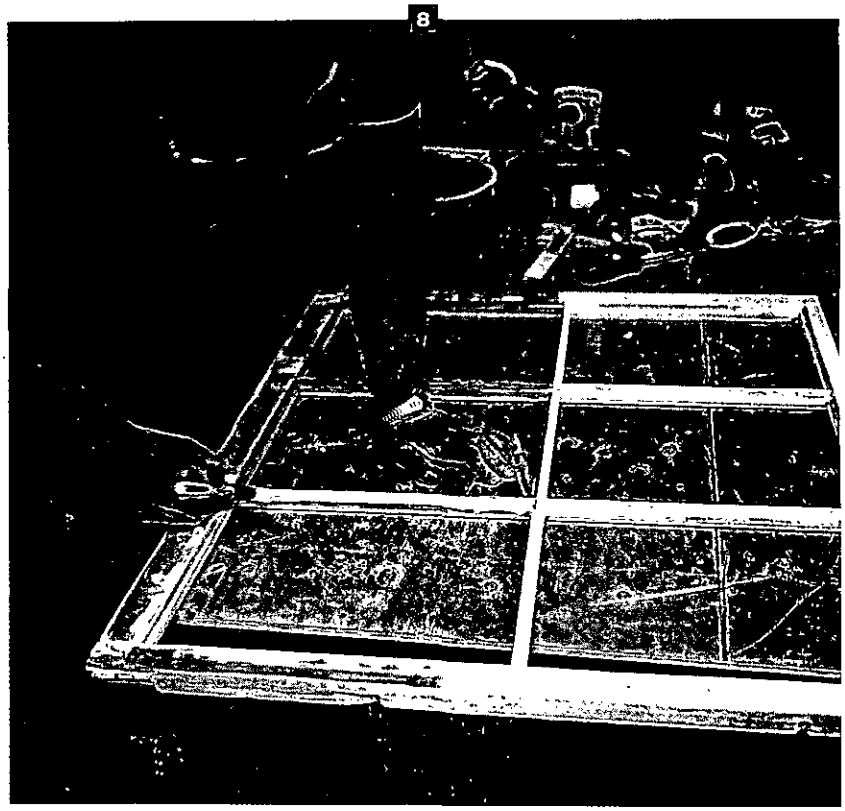
On the long-neglected windows in Salem, peeling paint indicated that water was getting in behind the putty. On some panes, the putty had cracked and curled; even where the putty looked good, Norm could slip his knife blade between putty and glass.

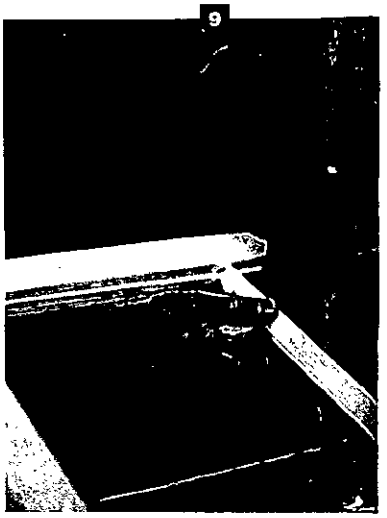
Norm doesn't patch putty. "The old compound is bound to fail sooner than the new stuff; better to have it all be the same age instead of trying to make a patch." That means removing the sash from the window. **(1)** First Norm takes out the stops, the vertical pieces of wood that confine the sash within the jamb. For stops nailed to the jamb, it's a simple matter to slip in a putty knife and gently pry the stop free, working from the bottom up. On these Federal-style windows, the stops are attached to folding interior shutters. Norm takes out shutters and stops together. In addition, the sash has been painted and caulked shut. With a carbide-tipped scraper and a thin putty knife, he removes the caulk and cracks the paint film from around the perimeter of the sash to free it.

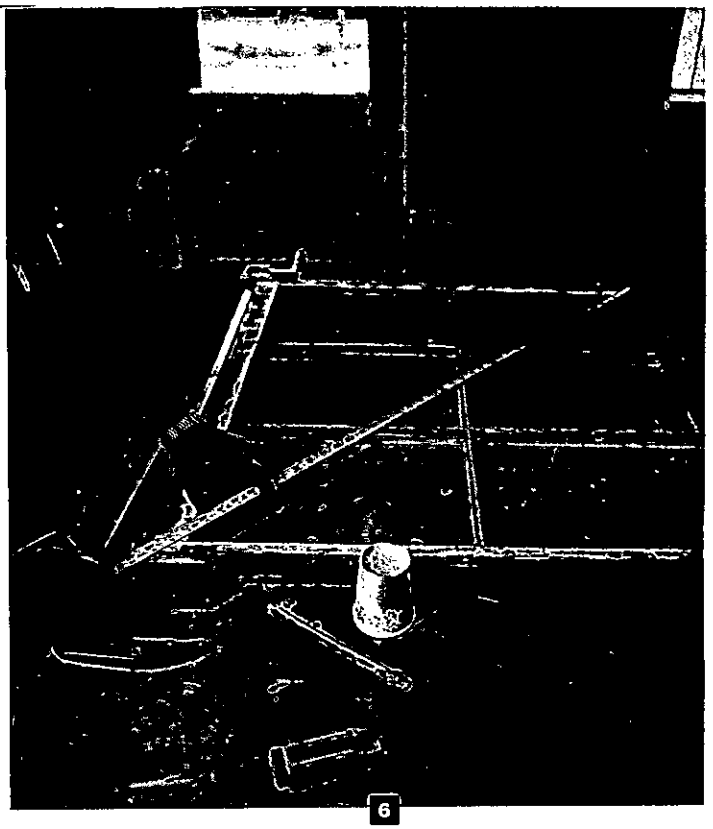
Norm reworks sash on a table whenever possible. "It's easier, and I'm less likely to damage the glass." **(2)** He sands the flat areas of the sash with a belt sander. A disposable respirator and a vacuum pickup with a HEPA filter minimize exposure to lead dust or to the asbestos that was used in glazing compound before 1977. **(3)** With a well-sharpened paint scraper, he scrapes the paint from the top edge of the muntins, which makes it easier to distinguish wood from putty as the putty is chipped out. **(4)** Removing putty with a putty knife requires care and concentration, particularly on sash with muntins and glass this delicate. Some craftsmen soften the compound with a heat gun, but, says Norm, "When there's lead paint, heat guns generate toxic fumes, and there's a greater likelihood of burning the wood or breaking the glass."

Once the exterior putty is off, Norm pries out the metal glazing points that hold the glass to the wood. He gently pushes out the glass, saving it for later, then scrapes off the putty remaining in the rabbet, the recess holding each pane. **(5)** The wood









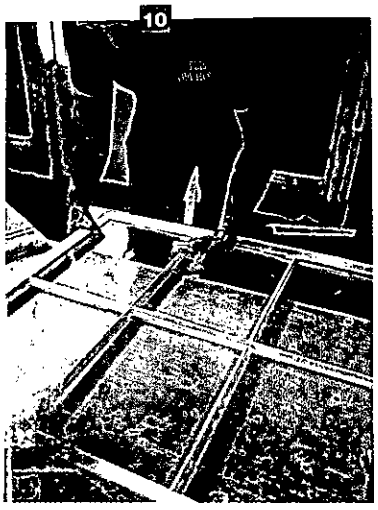
itself is in good shape. Dovetailed, pegged mortise-and-tenon joints reveal the fine craftsmanship required in the days before reliable adhesives. Without the glass in place, though, the sash is as wobbly as a newborn fawn. Norm drills out the pegs, opens and cleans the joints and brushes on some quick-setting epoxy before reassembling the pieces. **(6)** With the sash clamped in place, he checks that both diagonal measurements are the same, indicating the sash is square. **(7)** All rabbets are scraped clean and sanded with a detail sander. Norm then paints an oil-based primer on the wood, inside and out. **(8)** Priming the rabbets keeps oil from leaching out of the glazing compound.

Norm reinstalls the sash. To avoid denting the putty, he won't clean the glass until the sash is painted.

Norm kneads a handful of glazing compound, making it tacky and elastic; he keeps a wad warm in his palm during the rest of the reglazing. **(9)** First he presses a thin layer of putty into the rabbet. **(10)** Then he gently wiggles each pane into the putty, making sure there are no voids and the glass doesn't touch wood. **(11)** With his putty knife, he pushes new glazing points across the glass and halfway into the wood. Each pane gets six points: two on each side (1½ inches from the corner) and one at top and bottom.

"Now comes the trickiest part," Norm says. "Tooling the putty." With his thumb, he presses a second, thicker layer of putty against the rabbet and around the edge of the glass. **(12)** Starting at the corner, he pulls the putty knife over the glazing compound in one firm stroke. To maintain a consistent angle, he keeps one corner of the knife on the glass, in line with the edge of the rabbet, and rests the end of the blade on the wood. If the knife pulls out the putty, either the knife is dirty or the putty needs warming; remove the putty and try again. With practice, you too can put a neat crease in the corner with a single stroke. "The less you play with it, the better," he says.

He uses a warm wad of putty to pick up excess left on the glass without denting the beveled putty. On the interior side, he trims away any squeeze-out between glass and muntin with his putty knife. Then he reinstalls the sash in the frame and replaces the stops. Oil paint can be applied the next day (latex paint won't adhere until the compound has dried for a couple of weeks). The last step: Norm tells the painter to make sure that the edge of the paint overlaps the glass slightly, providing an added barrier against water infiltration.



Epoxy Sill Repair

Exterior sills and casings bear the brunt of weather with no more protection than a coat of paint. Little wonder they are the first to suffer the effects of decay.

After two centuries of battering by rain, ice, snow and heat, the old sills on the Salem house were in remarkably good condition, a testament to the excellent qualities of the old-growth white cedar trees that were used in the 18th century. Even so, evidence of paint failure and probes of the wood indicated that water was making inroads, laying down pathways for rot.

Rather than go through the effort of replacing the sills, with wood almost certainly of lesser quality, *This Old House* brought in John Stahl of Stahl Restorations Inc., a company specializing in wood window repair. Stahl uses Window Care Systems, a proprietary epoxying technique developed in the Netherlands. He turned to this system when his repairs using epoxy to harden decayed wood began to fail within a few years. Unlike most epoxies, the Dutch product remains flexible after curing.

(1) Before beginning any work, Stahl first assesses the wood's moisture content with a moisture meter. Epoxy cannot adhere well to wood with a moisture content higher than 18 percent, and even if it could be made to stick, the trapped moisture under its impermeable coat could wreak havoc. **(2)** A heat gun rated at 1,100 degrees Fahrenheit strips all the paint and helps dry out the wood. **(3)** Stahl routs out any decayed wood with a flexible-shaft router that looks, sounds and works like a giant dentist's drill. **(4)** He works the bit into checks (cracks in the surface of the wood), joints, exposed end grain and anywhere the wood shows signs of decay. A higher-pitched motor whine tells Stahl when the bit reaches sound, solid wood, which doesn't hold excess moisture. The rationale for all this routing is that a decayed substrate, even one soaked with epoxy consolidants, will only produce a weak, temporary repair.

Once again, Stahl probes with his moisture meter to make sure the wood is dry enough, then he sands the surface with a belt sander. **(5)** Next he brushes on a thin epoxy primer formulated to penetrate the wood and ensure a good bond with a second coat of epoxy. **(6)** Before the primer cures, within 20 minutes or so, tubes of hardener and resin are dispensed in the proper ratio from a side-by-side gun. **(7)** When mixed together, this thick epoxy paste fills the routed gaps and grooves without sagging. No additional fillers are required. **(8)** Stahl also epoxies the top of the sill. After the epoxy cures—in about 24 hours—he sands the repair to its original level, until some wood shows through, then paints. The sill now looks brand new, and wood of irreplaceable quality has been saved.

Wood and epoxy both need a protective coat of paint once the repair is complete.

It took Stahl two hours over two days to repair this sill, at a cost of $166. For homeowners who want to do the work themselves, a similar repair kit will be available in December 1995.

Old Glass—Irreplaceable Artifact

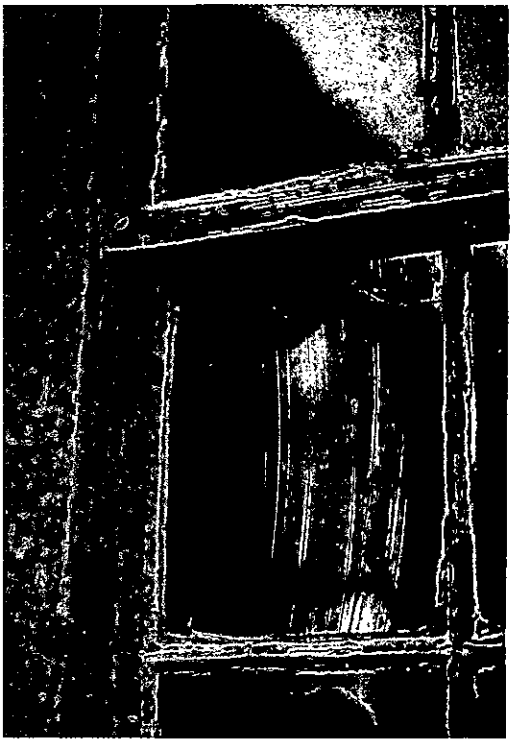
No discussion of old windows is complete without mention of the glass that went into them. Like an old, handcrafted wooden sash, old glass—with its wavy modulations, its seeds, "blisters," lines, "vesicles" and other imperfections—is a valuable artifact in its own right, one that deserves to be preserved.

Glass is made by heating a mixture of silica sand, crushed limestone, soda ash and feldspar to about 1,700 degrees Fahrenheit. Until the early part of the 20th century, all the glass for windows was made by hand—and mouth—through the prodigious efforts of artisans skilled in the manipulation of this brittle material.

From the early 17th century right up to the mid-1800s, windows were made with **crown glass**. The glassmaker spun a ball of molten glass on the end of a pontil rod until it formed into a disc, or crown, about 3 to 5 feet in diameter. Crown glass was the high-quality glass of its time but had severe drawbacks: Only a limited number of panes could be cut from a single crown, so lights of this period tended to be small; only the most wealthy could afford large panes.

Mouth-blown cylinder glass, long an inferior alternative to crown glass, became the window glass of choice in the mid-19th century, when improved techniques enabled panes to be made bigger, faster and more cheaply. Larger glass sheets meant windows needed fewer muntins, allowing the many permutations found in Victorian windows.

Cylinder glass was fabricated by a three-man team—a "gatherer," a "blower" and a "snapper." The gatherer first collected the molten glass, or "metal," into a 24-pound lump, called a gather, at the end of a 6-foot-long, 24-pound iron pipe. Then the blower would take over, twirling and blowing into the viscous gather while swinging it over a pit, or "swing hole," until it became a thin-walled cylindrical bubble about 1 foot in diameter and up to 7 feet long. When it reached the desired length, the bubble's end was cut or blown open, and the cylinder was set horizontally on a stand, or "horse," to cool. The snapper then cut the glass off the pipe and scored ("snapped") the cylinder lengthwise. The cut cylinder was reheated in a furnace, where it was prodded, rubbed and pushed with a wet alderwood flattener until it formed into a rectangular sheet. After it was annealed (cooled) for nearly an hour, the sheet was moved to the cutting room. Together, these three men were able to make nine cylinders per hour in an eight-hour day.

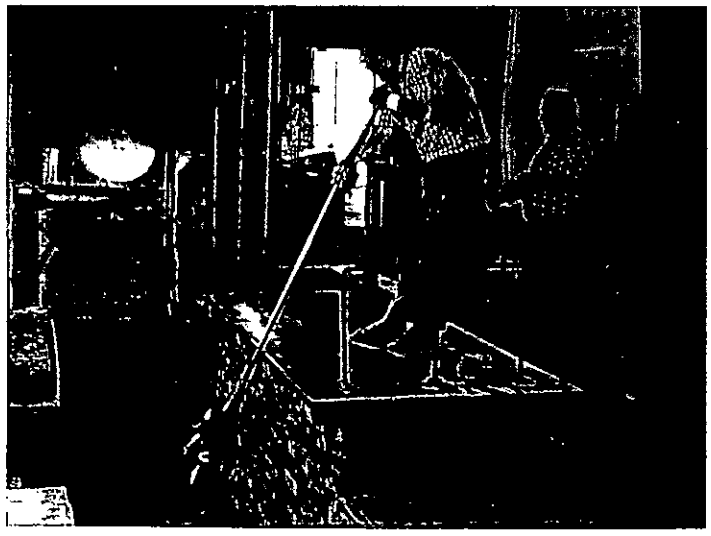


The curved striations in this old pane are the telltale signature of crown glass.

SALVAGING OLD GLASS

Norm replaced the broken panes in the Salem house with Restoration Glass from the S.A. Bendheim Co. This modern, mouth-blown cylinder glass has the same imperfections as old glass. Such new "old glass" is beautiful, but at $15 per pane, it's also expensive. One alternative is to salvage glass from old windows that are being tossed out. Tom Silva took the glass from some old storm windows moldering in the basement of the Salem house and had it cut to fit the new sash for the kitchen. You'll find old window glass at landfills or on the street during bulky trash pickup days.

Compressed air and machinery replaced lungs and handcraftsmanship in 1905, when factories began making **machine-blown cylinder glass**, using a technique that created towering glass cylinders up to 40 feet tall and 2 feet in diameter. Cylinder glass began to be replaced in the 1920s by **drawn glass**, produced from sheets instead of cylinders, and **plate glass**, a poured and polished glass made primarily for automobiles. In 1958, **float glass**—so called because the glass sheets are flowed out on a bed of molten tin—introduced a hitherto impossible distortion-free and defect-free uniformity. Now, with virtually all window glass being manufactured with the float-glass method, the distinctive flaws of old glass are almost irreplaceable. When you consider what it took to produce old glass, casually throwing it away seems a shame.



Mouth-blown window glass is still made in Germany. Here, a blower elongates a cylinder of molten glass over the swing hole.

GUIDE TO SALEM WINDOWS

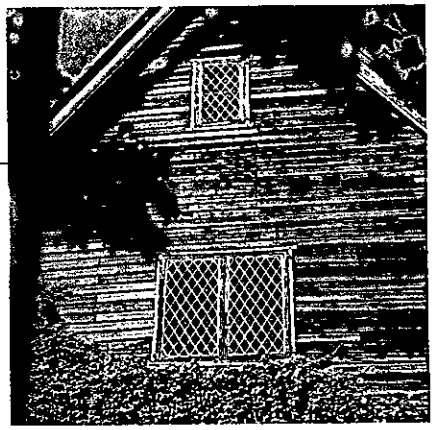
As one of the oldest cities in the United States, Salem, founded in 1626, has houses from every major architectural period in the country, with windows to match.

EARLY COLONIAL

17th century

Casement sash (hinged on the side, swings out). Lead strips, called caming, support tiny diamond-shape panes, or quarrels.

Narbonne House (18th-century addition)
71 Essex Street



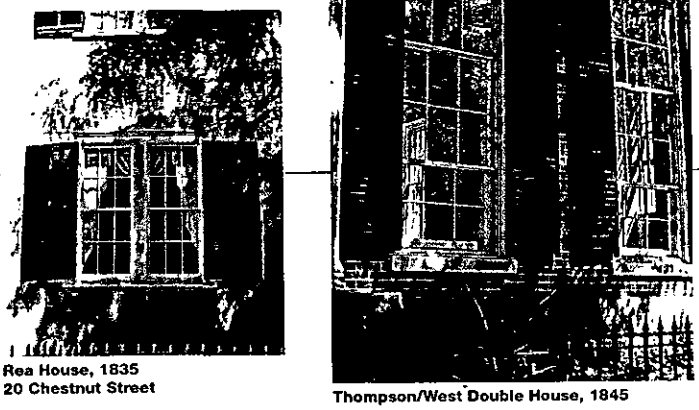
Pickman House (reproduction), 1660
20 Liberty Street

Derby House, 1762
168 Derby Street

GEORGIAN

Early to mid 18th century

Double- or single-hung sash moves up and down. Rectangular panes, wide muntins.



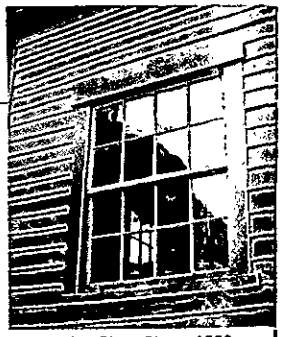
Thompson/West Double House, 1845
38-40 Chestnut Street

Rea House, 1835
20 Chestnut Street

FEDERAL

Late 18th, early 19th century

Single, double or triple-hung sash; narrow muntins; larger rectangular panes.

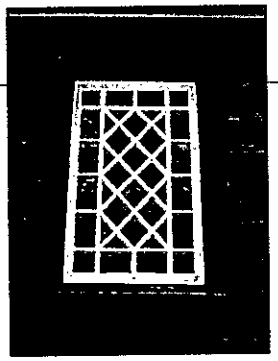


Lye-Tapley Shoe Shop, 1830
Peabody Essex Museum

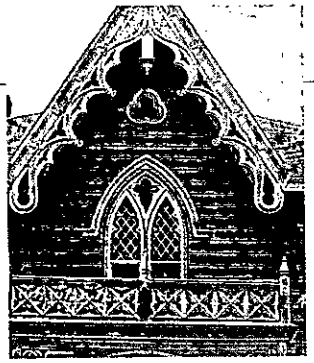
VICTORIAN

Early to late 19th century

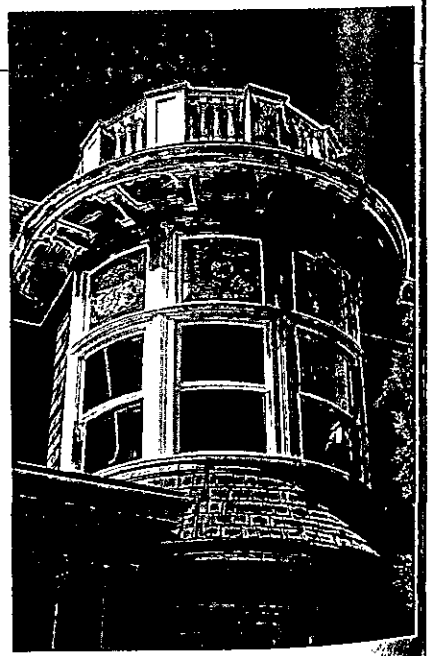
Double-hung sash with pulley-and-weight mechanisms. Fewer muntins, larger panes, sometimes curved to fit bowfronts. Muntin divisions manipulated to match a particular style.



Bouchard House, 1916
7 Hancock Street



Brooks House, 1851
260 Lafayette Street

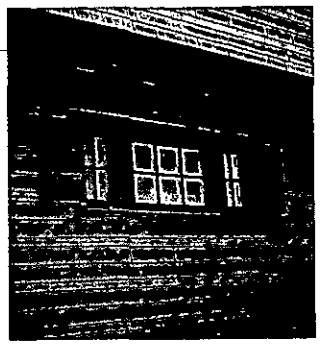


Parsons House, 1897
25 Washington Square North

ARTS AND CRAFTS

Early 20th century

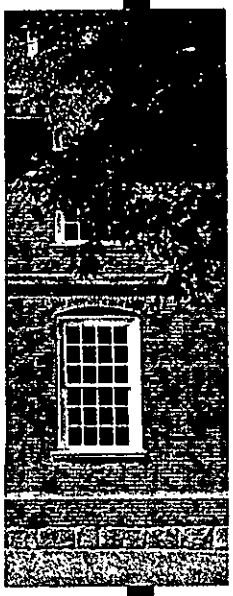
A revolt against Victorian excess, returning to simple shapes and patterns. Square panes, square muntins.



56 Ocean Avenue, 1908

HOW TO GAUGE A WINDOW'S AGE

Determining whether a window is original to a house is a tricky business. So we asked Walter Phelps, whose Brattleboro, Vermont, company duplicates historic sash and windows, to come to Salem and tell us what he sees when he looks at a window. Phelps confirmed the old windows of the Salem house were "quintessential Federal style," and likely original to the house. The clues? Narrow **muntins**, for one thing. Barely half an inch wide, they hardly interrupt the six panes of glass in the sash. The 10-by-14-inch **pane** size is another indication of a Federal house—in this case, one with an affluent owner. Old glass came in standard sizes dictated by the way glass was manufactured; larger sizes are indicative of an owner's wealth. Earlier Georgian-period windows tend to have many smaller rectangular panes—sometimes as many as 12 per sash—held in place with wide, shallow muntins.



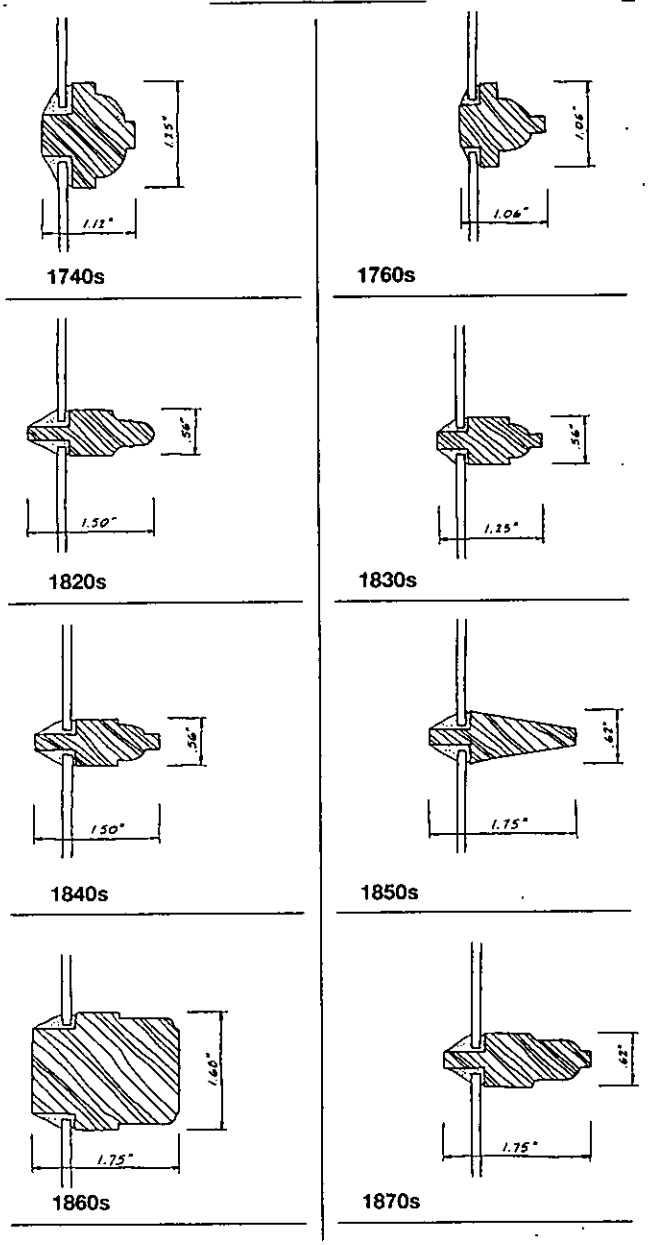
At the same time, the Salem windows don't have features common in later windows, such as **parting beads**—vertical strips of wood in the frame to keep the upper and lower sashes in separate tracks. The lower sash of the Salem house simply slides between the stop and the upper sash. Also, **window frames** in the Victorian era were boards nailed together and fitted within the wall. The Federal windows in Salem have thick mortised-and-tenoned frames nailed to the outside sheathing. Later windows typically had **weights and pulleys** to counterbalance the top and bottom sash, and **sash locks**. On the Salem house, a simple clip keeps the lower sash open or locked. (The upper sash are fixed in place.) Advances in 19th-century glassmaking allowed the use of much larger panes and fewer muntins than during the Federal period. But pane size alone isn't a reliable indicator of a window's age. In the Victorian era, the proliferation of pattern books and sash factories made window design more a function of fashion than something limited by the available technology.

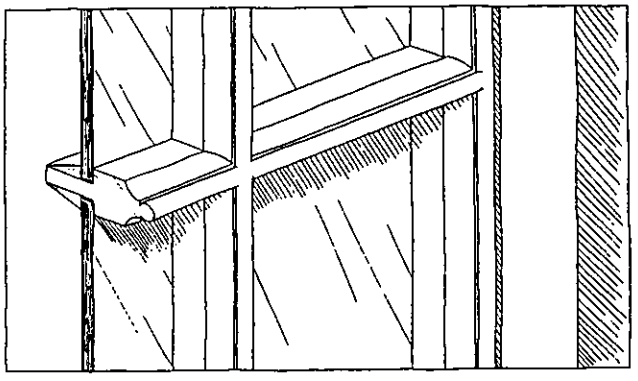
Putnam-Balch House, 1871
329 Essex Street

Phelps cautions against using any one detail to determine window vintage. "You need hard evidence: paint samples, construction techniques, glazing dimensions, house deeds and the like," he says. With these clues (and others), a window's provenance becomes more certain, as does the history of the house itself.

historic muntin profiles

Fashion and technology dictated how window makers dressed up their creations.





On the Salem windows, a delicate bead-and-cove profile, or "sticking," was planed into muntins, stiles and rails as way to add visual interest to the inside of the sash.

MUNTIN PROFILES COURTESY NATIONAL BUILDING MUSEUM
ILLUSTRATIONS BY JOHN MURPHY

See Directory, on page 118, for details and sources